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CoE 197S

Feature Activity 02

A. Getting set-up

Pulled this image from last activity already

```
C:\Users\Rafael>docker images
REPOSITORY   TAG       IMAGE ID       CREATED        SIZE
ubuntu       16.04     065cf14a189c   20 hours ago   135MB

C:\Users\Rafael>
```

B. Modifying an image

Let's run the image in a new container and install the `ping` utility.

1. First start the container with `/bin/bash`:

```
    $ docker run -it ubuntu:16.04 /bin/bash
    root@786b94c53c6d:/#
```

2. Try running `ping` in the terminal.

```
C:\Users\Rafael>docker run -it ubuntu:16.04 /bin/bash
root@22b008a51543:/# ping
bash: ping: command not found
root@22b008a51543:/#
```

The command doesn't exist. The Ubuntu image for Docker only has the bare minimum of software installed to operate the container. That's okay though: we can install the `ping` command.

2. But first we'll update our software list.

In Debian-based Linux environments (such as Ubuntu), you can install new software using the `apt` package manager. For those who have experience with Macs, this program is the equivalent of `homebrew`.

By default, to reduce the image size, the Ubuntu image doesn't have a list of the available software packages. We need to update the list of available software:

```
root@786b94c53c6d:/# apt-get update
```

```
root@22b008a51543:/# apt-get update
Get:1 http://security.ubuntu.com/ubuntu xenial-security InRelease [109 kB]
Get:2 http://archive.ubuntu.com/ubuntu xenial InRelease [247 kB]
Get:3 http://security.ubuntu.com/ubuntu xenial-security/main amd64 Packages [2051 kB]
Get:4 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [109 kB]
Get:5 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [107 kB]
Get:6 http://archive.ubuntu.com/ubuntu xenial/main amd64 Packages [1558 kB]
Get:7 http://security.ubuntu.com/ubuntu xenial-security/restricted amd64 Packages [15.9 kB]
Get:8 http://security.ubuntu.com/ubuntu xenial-security/universe amd64 Packages [984 kB]
Get:9 http://archive.ubuntu.com/ubuntu xenial/restricted amd64 Packages [14.1 kB]
Get:10 http://archive.ubuntu.com/ubuntu xenial/universe amd64 Packages [9827 kB]
Get:11 http://security.ubuntu.com/ubuntu xenial-security/multiverse amd64 Packages [8820 B]
Get:12 http://archive.ubuntu.com/ubuntu xenial/multiverse amd64 Packages [176 kB]
Get:13 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 Packages [2559 kB]
Get:14 http://archive.ubuntu.com/ubuntu xenial-updates/restricted amd64 Packages [16.4 kB]
Get:15 http://archive.ubuntu.com/ubuntu xenial-updates/universe amd64 Packages [1544 kB]
Get:16 http://archive.ubuntu.com/ubuntu xenial-updates/multiverse amd64 Packages [26.2 kB]
Get:17 http://archive.ubuntu.com/ubuntu xenial-backports/main amd64 Packages [10.9 kB]
Get:18 http://archive.ubuntu.com/ubuntu xenial-backports/universe amd64 Packages [12.7 kB]
Fetched 19.4 MB in 1min 19s (245 kB/s)
Reading package lists... Done
root@22b008a51543:/#
```

Now we can install the `ping` command.

Call `apt-get install iputils-ping` to install the package containing `ping`:

```
Reading package lists... Done
root@22b008a51543:/# apt-get install iputils-ping
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libffi6 libgmp10 libgnutls-openssl27 libgnutls30 libhogweed4 libidn11 libnettle6
Suggested packages:
  gnutls-bin
The following NEW packages will be installed:
  iputils-ping libffi6 libgmp10 libgnutls-openssl27 libgnutls30 libhogweed4 libidn
0 upgraded, 10 newly installed, 0 to remove and 0 not upgraded.
Need to get 1307 kB of archives.
After this operation, 3781 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://archive.ubuntu.com/ubuntu xenial/main amd64 libgmp10 amd64 2:6.1.0+df
Get:2 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 libnettle6 amd64
Get:3 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 libhogweed4 amd64
Get:4 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 libidn11 amd64 1.
Get:5 http://archive.ubuntu.com/ubuntu xenial/main amd64 libffi6 amd64 3.2.1-4 [17
Get:6 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 libp11-kit0 amd64
Get:7 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 libtasn1-6 amd64
Get:8 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 libgnutls30 amd64
Get:9 http://archive.ubuntu.com/ubuntu xenial-updates/main amd64 libgnutls-openssl
Get:10 http://archive.ubuntu.com/ubuntu xenial/main amd64 iputils-ping amd64 3:201
Fetched 1307 kB in 6s (215 kB/s)
debconf: delaying package configuration, since apt-utils is not installed
Selecting previously unselected package libgmp10:amd64.
(Reading database ... 4785 files and directories currently installed.)
Preparing to unpack .../libgmp10 2%3a6.1.0+dfsg-2 amd64.deb ...
```

```
Selecting previously unselected package libp11-kit0:amd64.
Preparing to unpack .../libp11-kit0_0.23.2-5~ubuntu16.04.2_amd64.deb ...
Unpacking libp11-kit0:amd64 (0.23.2-5~ubuntu16.04.2) ...
Selecting previously unselected package libtasn1-6:amd64.
Preparing to unpack .../libtasn1-6_4.7-3ubuntu0.16.04.3_amd64.deb ...
Unpacking libtasn1-6:amd64 (4.7-3ubuntu0.16.04.3) ...
Selecting previously unselected package libgnutls30:amd64.
Preparing to unpack .../libgnutls30_3.4.10-4ubuntu1.8_amd64.deb ...
Unpacking libgnutls30:amd64 (3.4.10-4ubuntu1.8) ...
Selecting previously unselected package libgnutls-openssl27:amd64.
Preparing to unpack .../libgnutls-openssl27_3.4.10-4ubuntu1.8_amd64.deb ...
Unpacking libgnutls-openssl27:amd64 (3.4.10-4ubuntu1.8) ...
Selecting previously unselected package iputils-ping.
Preparing to unpack .../iputils-ping_3%3a20121221-5ubuntu2_amd64.deb ...
Unpacking iputils-ping (3:20121221-5ubuntu2) ...
Processing triggers for libc-bin (2.23-0ubuntu11.3) ...
Setting up libgmp10:amd64 (2:6.1.0+dfsg-2) ...
Setting up libnettle6:amd64 (3.2-1ubuntu0.16.04.2) ...
Setting up libhogweed4:amd64 (3.2-1ubuntu0.16.04.2) ...
Setting up libidn11:amd64 (1.32-3ubuntu1.2) ...
Setting up libffi6:amd64 (3.2.1-4) ...
Setting up libp11-kit0:amd64 (0.23.2-5~ubuntu16.04.2) ...
Setting up libtasn1-6:amd64 (4.7-3ubuntu0.16.04.3) ...
Setting up libgnutls30:amd64 (3.4.10-4ubuntu1.8) ...
Setting up libgnutls-openssl27:amd64 (3.4.10-4ubuntu1.8) ...
Setting up iputils-ping (3:20121221-5ubuntu2) ...
Setcap is not installed, falling back to setuid
Processing triggers for libc-bin (2.23-0ubuntu11.3) ...
```

Finally, we should be able to use `ping`.

   Ping your favorite website. When you've seen enough, `Ctrl+C` to interrupt, then `exit` the container.

```
root@22b008a51543:/# ping google.com
PING google.com (142.250.66.46) 56(84) bytes of data.
64 bytes from 142.250.66.46: icmp_seq=1 ttl=37 time=122 ms
64 bytes from 142.250.66.46: icmp_seq=2 ttl=37 time=46.1 ms
64 bytes from 142.250.66.46: icmp_seq=3 ttl=37 time=46.7 ms
64 bytes from 142.250.66.46: icmp_seq=4 ttl=37 time=43.3 ms
64 bytes from 142.250.66.46: icmp_seq=5 ttl=37 time=45.4 ms
64 bytes from 142.250.66.46: icmp_seq=6 ttl=37 time=45.2 ms
64 bytes from 142.250.66.46: icmp_seq=7 ttl=37 time=46.0 ms
64 bytes from 142.250.66.46: icmp_seq=8 ttl=37 time=45.4 ms
64 bytes from 142.250.66.46: icmp_seq=9 ttl=37 time=45.8 ms
64 bytes from 142.250.66.46: icmp_seq=10 ttl=37 time=44.0 ms
64 bytes from 142.250.66.46: icmp_seq=11 ttl=37 time=43.0 ms
64 bytes from 142.250.66.46: icmp_seq=12 ttl=37 time=46.3 ms
^C
--- google.com ping statistics ---
12 packets transmitted, 12 received, 0% packet loss, time 11020ms
rtt min/avg/max/mdev = 43.055/51.721/122.967/21.511 ms
root@22b008a51543:/# exit
exit
```

C. Committing Changes

Installing `ping` isn't very special in itself. But what if you wanted to have `ping` on all of your `ubuntu` containers? You'd have to redo this installation each time you spin up a new container, and that isn't much fun.

The Docker way is to create a new image. There are two ways to do this: 1) build a new image from scratch or 2) commit a container state as a new image. We'll cover how to do #1 in the "Building Images" exercise, but we can do #2 now.

1. Let's find our container to create the new image from.

   Fortunately, we have a Docker container with our `ping` utility already installed from the previous steps. It should be stopped right now, but let's find its container ID.

   ```
   $ docker ps -a
```

```
C:\Users\Rafael>docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED          STATUS                      PORTS
22b008a51543   ubuntu:16.04   "/bin/bash"              10 minutes ago   Exited (0) 3 minutes ago
anguly
84b0ad83f4f7   ubuntu:16.04   "/bin/bash"              33 minutes ago   Exited (0) 33 minutes ago
tsumoto
b587dc5becea   ubuntu:16.04   "/bin/echo 'Hello wo…"   38 minutes ago   Exited (0) 38 minutes ago
```

2. Now let's commit it as a new image.

`docker commit` takes a container, and allows you to commit its changes as a new image.

```
$ docker commit --help

Usage:  docker commit [OPTIONS] CONTAINER [REPOSITORY[:TAG]]

Create a new image from a container's changes

Options:
      -a, --author string    Author (e.g., "John Hannibal Smith <hannibal@a-team.com>")
      -c, --change list      Apply Dockerfile instruction to the created image (default [])
          --help             Print usage
      -m, --message string   Commit message
      -p, --pause            Pause container during commit (default true)
$
```

Pass the container ID, an author, commit message, and give it the name `<DockerHub username>/ping`:

```
$ docker commit -a 'David Elner' -m 'Added ping utility.' 786 delner/ping
```

Then check `docker images` to see your new image:

```
Create a new image from a container's changes

C:\Users\Rafael>docker commit 22b delner/ping
sha256:2c565f8b87a43d0308406bffc21e1bb12079bdf19ffeb6114b575d9df58edc7f

C:\Users\Rafael>docker images
REPOSITORY    TAG       IMAGE ID       CREATED          SIZE
delner/ping   latest    2c565f8b87a4   10 seconds ago   170MB
ubuntu        16.04     065cf14a189c   20 hours ago     135MB

C:\Users\Rafael>
```

Finally run your new image in a new container to see it in action!

```
C:\Users\Rafael>docker run -it --rm delner/ping /bin/bash
root@fb32c5f98133:/# ping google.com
PING google.com (142.250.66.46) 56(84) bytes of data.
64 bytes from 142.250.66.46: icmp_seq=1 ttl=37 time=57.7 ms
64 bytes from 142.250.66.46: icmp_seq=2 ttl=37 time=46.0 ms
64 bytes from 142.250.66.46: icmp_seq=3 ttl=37 time=44.8 ms
^C
--- google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 44.893/49.546/57.743/5.819 ms
root@fb32c5f98133:/# _
```